Resolving drivers of variability in estuarine metabolism from sustained observations of water quality in the SE US

Michael C. Murrell[1]
Jane M. Caffrey[2]
Kendra R. Straub[2]
James D. Hagy, III[1]
Mark Woodrey[3]
Scott Phipps[4]
Jennifer Wanat[5]
Lee Edmiston[5]
Mike Shirley[6]

[1]US Environmental Protection Agency, Gulf Ecology Division, 1 Sabine Island Dr., Gulf Breeze, FL 32561
[2]University of West Florida, Center for Diagnostics and Bioremediation, Pensacola, FL
[3]Grand Bay Estuarine Research Reserve, 6500 Bayou Heron Road, Moss Point, MS, 39562
[4]Weeks Bay Estuarine Research Reserve, 11300 US Hy 98, Fairhope, AL 36562.
[5]Apalachicola Bay Estuarine Research Reserve, 350 Carroll Street
Eastpoint, FL 32328-3529
[6]Guana, Tolomatos, and Matanzas Estuarine Research Reserve, 505 Guana River Road
Ponte Vedra Beach, FL 32082

We examine trends in water quality in long-term monitoring (10-15 y) data collected at 5 estuarine systems of NOAA's National Estuarine Research Reserve System: Grand Bay, MS; Weeks Bay, AL; Apalachicola Bay, FL; Rookery Bay, FL, and Guana Tolomatos and Matanzas Rivers, FL. These estuaries vary in size, flow regime, watershed area, anthropogenic influence, and land use. Water quality variables, include water temperature, salinity, dissolved oxygen, and pH were measured with *in-situ* data sondes at multiple sites in each system as part of the National Estuarine Research Reserves System Wide Monitoring Program. We examine seasonal and interannual patterns in these water quality data for temporal coherence both within and among the estuaries. Preliminary analysis shows strong coherence among all systems in annual salinity anomaly, calculated as the deviation of annual mean salinity from the long term mean, with highest salinity observed during the droughts of 2000-2002 and 2006-2007. The frequency of hypoxia (DO < 2 mg/L), used as an index of potential eutrophication, occurred infrequently at some sites (<1% of the record) and regularly at others (up to 17% of the annual record in Weeks Bay). The dissolved oxygen data will also be used to calculate daily gross production, respiration and net ecosystem metabolism (NEM) parameters. We hypothesize that warmer temperatures or higher flow regimes will cause a decrease in NEM, while relatively cooler temperatures or lower flow regimes will result in higher NEM. Consistent with this hypothesis, prior analyses of Apalachicola and Weeks Bays data showed that gross production decreased during high flow periods, likely due to changes in turbidity and residence time.